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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/696,220	10/26/2000	Masafumi Kokura	925-165	4305

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EXAMINER
AUGHENBAUGH, WALTER

ART UNIT	PAPER NUMBER
1772	

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/696,220	KOKURA ET AL.	
	Examiner	Art Unit	
	Walter B Aughenbaugh	1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-11 and 15-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-11 and 15-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Acknowledgement of Applicant's Amendments

1. The amendments made in claims 5, 11 and 15-17 in the Amendment filed January 20, 2004 (Amdt. D) have been received and considered by Examiner.

2. The cancellation of claims 12-14 in Amdt. D has been acknowledged by Examiner. N.B. claim 6 was cancelled in Paper 10.

WITHDRAWN OBJECTIONS

3. The objection to claim 11 repeated in paragraph 10 of Paper 15 has been withdrawn due to Applicant's amendments to claim 11 in Amdt. D.

WITHDRAWN REJECTIONS

4. The 35 U.S.C. 112, first paragraph rejection of claim 11 repeated in paragraph 11 of Paper 15 has been withdrawn due to Applicant's amendments to claim 11 in Amdt. D.

5. The 35 U.S.C. 112, second paragraph rejection of claims 5, 11 and 15-17 made of record in paragraph 13 of Paper 15 has been withdrawn due to Applicant's amendments to the claims in Amdt. D.

6. The 35 U.S.C. 112, second paragraph rejection of claims 13 and 14 made of record in paragraph 13 of Paper 15 has been withdrawn due to Applicant's cancellation of claims 13 and 14 in Amdt. D.

7. The 35 U.S.C. 102 rejection of claims 12 and 14 made of record in paragraph 15 of Paper 15 has been withdrawn due to Applicant's cancellation of claims 12 and 14 in Amdt. D.

8. The 35 U.S.C. 103 rejection of claims 1-5, 7-11 and 15-17 made of record in paragraphs 16 and 17 of Paper 15 have been withdrawn due to Applicant's arguments regarding the rejection of claims 1, 7 and 11 in Amdt. D.

9. The 35 U.S.C. 103 rejection of claim 13 made of record in paragraph 17 of Paper 15 has been withdrawn due to Applicant's cancellation of claim 13 in Amdt. D.

NEW REJECTIONS

Claim Rejections - 35 USC § 112

10. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recitation "so that molybdenum of said film comprising molybdenum nitride is in direct contact with" is confusing. This recitation suggests that the molybdenum atoms of the molybdenum nitride compound are "in direct contact with" the recited components while the nitrogen atoms of the molybdenum nitride compound somehow are not "in direct contact with" the recited components; if a molybdenum nitride film "is in direct contact with" recited components, both molybdenum atoms and nitrogen atoms are necessarily "in direct contact with" the recited components. Does Applicant intend to recite "so that the molybdenum nitride of said film comprising molybdenum nitride is in direct contact with"?

Claim Rejections - 35 USC § 103

11. Claims 1, 2, 4, 5, 7, 9, 11 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitsui et al. in view of Lee.

In regard to claim 1, Mitsui et al. teach a liquid crystal display (LCD) comprising at least one thin film transistor (TFT) (item 40), an interlayer insulator (insulating film, item 42) and at

least one reflective pixel electrode (reflective metal film, item 38) defining at least part of a pixel of the LCD and being supported by a substrate (item 31) (col. 9, lines 43-55).

Mitsui et al. fail to teach that a film comprising molybdenum nitride is formed immediately below and in contact with the reflective pixel electrode and above and contacting the interlayer insulator so that the molybdenum nitride is at least partially located between and contacting each of the reflective pixel electrode and the interlayer insulator so that a bottom surface of the molybdenum nitride is located over and contacting a top surface of the interlayer insulator and a top surface of the molybdenum nitride is located under and contacting the reflective pixel electrode.

Lee, however, disclose a TFT comprising a molybdenum nitride barrier layer (item 49, Fig. 3) that is formed between an interlayer insulator (item 47) and an electrode (item 45) (col. 6, lines 54-56, col. 7, lines 2-3, 13-14, 20-30 and Fig. 3). Lee disclose that the molybdenum nitride barrier layer prevents anodic oxidation on the electrode, thus avoiding thinning of the electrode (col. 5, lines 53-58). Therefore, one of ordinary skill in the art would have recognized to have inserted the molybdenum nitride layer of Lee between the interlayer insulator of Mitsui et al. and the pixel electrode of Mitsui et al. (which would result in the molybdenum nitride layer contacting a top surface of the interlayer insulator and the pixel electrode) in order to prevent anodic oxidation on the pixel electrode, and to consequently avoid thinning of the electrode, as taught by Lee.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have inserted the molybdenum nitride layer of Lee between the interlayer insulator of Mitsui et al. and the pixel electrode of Mitsui et al. (which would result in the molybdenum

nitride layer contacting a top surface of the interlayer insulator and the pixel electrode) in order to prevent anodic oxidation on the pixel electrode, and to consequently avoid thinning of the electrode, as taught by Lee.

In regard to claim 2, Mitsui et al. teach that the reflective pixel electrode (item 38) comprises aluminum (col. 14, lines 54-56). In regard to claim 4, Mitsui et al. teach that the interlayer insulator (item 42) comprises a photosensitive resin (col. 6, lines 6-19 and 54-68). In regard to claim 5, Mitsui et al. teach that the interlayer insulator comprises a high molecular resin (equivalently a polymeric resin) (col. 5, lines 14-16).

In regard to claim 15, Mitsui et al. teach that the pixel electrode (item 38) is in electrical communication with a drain electrode (item 37 of Mitsui et al.) of the TFT through a contact hole (item 43 of Mitsui et al.) defined in the interlayer insulator (item 42) (col. 9, lines 43-52 and Fig. 5). Furthermore, since Fig. 5 of Mitsui et al. shows that the reflective pixel electrode (item 38) extends well to the right of the contact hole (item 43) along the interlayer insulator (item 42), the combination of Mitsui et al. with Lee results in the combination of the reflective pixel electrode (item 38) located over and contacting the film comprising molybdenum nitride at least in areas not in the contact hole (e.g. the bumps 42a, or any given group of bumps, are "areas not in" the contact hole, col. 9, lines 53-59).

In regard to independent claim 7 and claim 9, Mitsui et al. teach a liquid crystal display comprising a liquid crystal layer (item 49) between a pair of substrates (items 31 and 45) (col. 10, lines 13-17 and Figure 5). Mitsui et al. also teach that the liquid crystal display has reflection electrodes (item 38) that are composed of aluminum formed on the insulating film (item 42) (col. 9, lines 65-68 and Figure 5). Mitsui et al. further teach a laminated layer provided on at least one

of the substrates wherein the laminated layer comprises an insulating film (item 42, col. 9, lines 53-55 and Figure 5). The reflective metal film (item 38) of Mitsui et al. necessarily has a light reflecting function and is provided in at least one pixel region of the display for contributing to displaying of images in the display as shown in Figure 5; therefore, in regard to claim 9, the reflective metal film (item 38) is a pixel electrode for applying a voltage to the liquid crystal layer.

Mitsui et al. fail to teach that the laminated layer comprises a film comprising molybdenum nitride laminated to and over at least part of the insulating film so that the molybdenum nitride contacts an upper surface of the insulating film and that the reflective metal film is formed on the laminated layer so as to contact the molybdenum nitride.

Lee, however, disclose a TFT comprising a molybdenum nitride barrier layer (item 49, Fig. 3) that is formed between an interlayer insulator (item 47, equivalently, an insulating film) and an electrode (item 45, equivalently, a metal film) (col. 6, lines 54-56, col. 7, lines 2-3, 13-14, 20-30 and Fig. 3). Lee disclose that the molybdenum nitride barrier layer prevents anodic oxidation on the electrode, thus avoiding thinning of the electrode (col. 5, lines 53-58). Therefore, one of ordinary skill in the art would have recognized to have inserted the molybdenum nitride layer of Lee between the insulating film of Mitsui et al. and the metal film of Mitsui et al. (which would result in the molybdenum nitride layer contacting an upper surface of the insulating film and the metal film) in order to prevent anodic oxidation on the metal film, and to consequently avoid thinning of the metal film, as taught by Lee.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have inserted the molybdenum nitride layer of Lee between the insulating film of

Mitsui et al. and the metal film of Mitsui et al. (which would result in the molybdenum nitride layer contacting an upper surface of the insulating film and the metal film) in order to prevent anodic oxidation on the metal film, and to consequently avoid thinning of the metal film, as taught by Lee.

In regard to claim 16, Mitsui et al. teach that the reflective metal film (item 38) is in electrical communication with a drain electrode (item 37 of Mitsui et al.) of the TFT through a contact hole (item 43 of Mitsui et al.) defined in the insulating film (item 42) (col. 9, lines 43-52 and Fig. 5). Furthermore, since Fig. 5 of Mitsui et al. shows that the reflective metal film (item 38) extends well to the right of the contact hole (item 43) along the insulating film (item 42), the combination of Mitsui et al. with Lee results in the combination of the reflective metal film (item 38) located over and contacting the molybdenum nitride at least in areas not in the contact hole (e.g. the bumps 42a, or any given group of bumps, are "areas not in" the contact hole, col. 9, lines 53-59).

In regard to independent claim 11, Mitsui et al. teach a liquid crystal display (LCD) comprising at least one thin film transistor (TFT) (item 40), an insulating layer (insulating film, item 42) at least partially provided over the TFT (see Fig. 5) and at least one reflective pixel electrode (reflective metal film, item 38) defining at least part of a pixel of the LCD (col. 9, lines 43-55).

Mitsui et al. fail to teach a film comprising molybdenum nitride in direct contact with the under-side of the reflective pixel electrode, so that molybdenum of the film comprising molybdenum nitride is in direct contact with both the underside of the reflective pixel electrode and an upper surface of the insulating layer.

Lee, however, disclose a TFT comprising a molybdenum nitride barrier layer (item 49, Fig. 3) that is formed between an interlayer insulator (item 47) and an electrode (item 45) (col. 6, lines 54-56, col. 7, lines 2-3, 13-14, 20-30 and Fig. 3). Lee disclose that the molybdenum nitride barrier layer prevents anodic oxidation on the electrode, thus avoiding thinning of the electrode (col. 5, lines 53-58). Therefore, one of ordinary skill in the art would have recognized to have inserted the molybdenum nitride layer of Lee between the insulating layer of Mitsui et al. and the pixel electrode of Mitsui et al. (which would result in the molybdenum nitride layer contacting both the underside of the pixel electrode and an upper surface of the insulating layer) in order to prevent anodic oxidation on the pixel electrode, and to consequently avoid thinning of the electrode, as taught by Lee.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have inserted the molybdenum nitride layer of Lee between the insulating layer of Mitsui et al. and the pixel electrode of Mitsui et al. (which would result in the molybdenum nitride layer contacting both the underside of the pixel electrode and an upper surface of the insulating layer) in order to prevent anodic oxidation on the pixel electrode, and to consequently avoid thinning of the electrode, as taught by Lee.

In regard to claim 17, Mitsui et al. teach that the pixel electrode (item 38) is in electrical communication with a drain electrode (item 37 of Mitsui et al.) of the TFT through a contact hole (item 43 of Mitsui et al.) defined in the insulating layer (item 42) (col. 9, lines 43-52 and Fig. 5). Furthermore, since Fig. 5 of Mitsui et al. shows that the reflective pixel electrode (item 38) extends well to the right of the contact hole (item 43) along the insulating layer (item 42), the combination of Mitsui et al. with Lee results in the combination of the reflective pixel electrode

(item 38) located over and contacting the film comprising molybdenum nitride at least in areas not in the contact hole (e.g. the bumps 42a, or any given group of bumps, are "areas not in" the contact hole, col. 9, lines 53-59).

12. Claims 3, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitsui et al. in view of Lee and in further view of Kurogane et al.

Mitsui et al. and Lee teach the liquid crystal display as discussed above.

In regard to claims 3 and 8, Mitsui et al. and Lee fail to teach that the film comprising molybdenum nitride has a nitrogen content between 5 atomic % and 30 atomic %. However, Kurogane et al. disclose a liquid crystal display (col. 9, lines 13-15) comprising a film comprising molybdenum nitride (item 9) (col. 2, lines 49-55 and col. 6, lines 3-5). Kurogane et al. disclose the variation of ratio of flow rate of N_2/Ar during the Mo film deposition in order to vary the resistance of the film comprising molybdenum nitride (col. 4, lines 51-62 and col. 8, line 63-col. 9, line 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to tailor the nitrogen concentration in the film comprising molybdenum nitride of the LCD taught by Mitsui et al. and Lee via variation in the processing parameters during nitrogen deposition into the Mo film in order to achieve the desired properties, such as resistance, depending on the desired end result as taught by Kurogane et al. since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art in the absence of unexpected results. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

In regard to claim 10, Mitsui et al. and Lee fail to teach that the LCD comprises an electrode comprising indium-tin oxide (ITO) formed on the same substrate on which the

reflective metal film is formed, wherein the film comprising molybdenum nitride is provided at least partially between the reflective metal film and the electrode comprising ITO. Kurogane et al., however, disclose an LCD comprising an ITO electrode (col. 1, lines 13-16 and col. 6, lines 7-11 and item 13, Fig. 1) formed on the same substrate on which the reflective metal film (aluminum alloy metal film, item 8) is formed, wherein the molybdenum nitride layer (item 9) is provided between the reflective metal film (item 8) and the electrode comprising ITO (item 13). Kurogane et al. disclose that the electrode comprising ITO is a pixel electrode and that it is well known to use electrodes made of ITO as pixel electrodes in LCDs (col. 1, lines 12-20). Therefore, one of ordinary skill in the art would have recognized to have provided the LCD taught by Mitsui et al. and Lee with an electrode comprising indium-tin oxide (ITO) formed on the same substrate on which the reflective metal film is formed, wherein the film comprising molybdenum nitride is provided at least partially between the reflective metal film and the electrode comprising ITO since it is notoriously well known to provide electrodes made of ITO as pixel electrodes in LCDs such that a film comprising molybdenum nitride is provided at least partially between the reflective metal film and the electrode comprising ITO as taught by Kurogane et al.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the LCD taught by Mitsui et al. and Lee with an electrode comprising indium-tin oxide (ITO) formed on the same substrate on which the reflective metal film is formed, wherein the film comprising molybdenum nitride is provided at least partially between the reflective metal film and the electrode comprising ITO since it is notoriously well known to provide electrodes made of ITO as pixel electrodes in LCDs such that a film

comprising molybdenum nitride is provided at least partially between the reflective metal film and the electrode comprising ITO as taught by Kurogane et al.

ANSWERS TO APPLICANT'S ARGUMENTS

13. Applicant's arguments on pages 8-9 of Amdt. D regarding the 35 U.S.C. 103 rejection of claims 1, 3 and 8 made of record in Paper 15 are rendered moot due to the withdrawal of the rejections of claims 1, 3 and 8 made of record in Paper 15 due to Applicant's arguments in Amdt. D. In response to Applicant's argument on page 9 of Amdt. D that Kurogane et al. "fails to disclose or suggest any MoN film having a nitrogen content from 5-30% *to enhance adhesion...*", the fact that Applicant uses the MoN film for a different purpose does not alter the conclusion that its use in a prior art device would be *prima facie* obviousness from the purpose disclosed in the reference. *In re Lintner*, 173 USPQ 560. Applicant alleges unexpected results, but Applicant has not met the burden on Applicant to establish that these results are unexpected and significant in that the evidence relied upon does not establish "that the differences in results are in fact unexpected and unobvious and of both statistical and practical significance" *Ex parte Gelles*, 22 USPQ2d 1318, 1319 (Bd. Pat. App. & Inter. 1992). The claimed invention must be compared with the closest prior art which is commensurate in scope with the claims as required by MPEP 716.02(b).

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter B. Aughenbaugh whose telephone number is 571-272-1488. The examiner can normally be reached on Monday-Thursday from 9:00am to 6:00pm and on alternate Fridays from 9:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Walter B. Aughenbaugh
04/01/04 WBA

HAROLD PYON
SUPERVISORY PATENT EXAMINER 4/1/04
1772